On *Super-acid and Sub-acid Salts.* *By* William Hyde Wollaston, *M.D. Sec. R.S.* Read January 28, 1808. [*Phil. Trans.* 1808, *p.* 96.]

The author having some time since observed various instances of super-acid salts, in which he found that the quantity of acid was exactly double of what would be necessary merely to saturate the alkali present, had intended to have pursued the inquiry, but was prevented by the publication of Mr. Dalton's theory of chemical combination, as explained by Dr. Thomson.

However, since it appeared that Mr. Dalton's theory was originally founded on the analysis of gases, which is attended with too many difficulties to be repeated by every one who may be desirous of verifying the law of simple multiples by experiment, the author thought it might be desirable to select from his observations certain experiments extremely easy to be repeated, each of which exhibits in itself the most direct and simple proof of the law under consideration.

The subcarbonates of potash and of soda are named as instances of salts containing exactly half the acid necessary to form their fully-saturated carbonates; and the proof is obtained by taking two quantities of either of these alkalies fully carbonated. One quantity being taken exactly double of the other, is exposed to a red heat, and is thereby reduced to a semi-carbonate; for it now yields the same measure of gas that is given out by the unburnt half quantity.

Super-sulphate of potash is adduced as an instance of a salt containing an exact double share of acid. The proof consists in taking two equal quantities of potash, to one of which is added any large quantity of sulphuric acid, and the mixture is exposed to a red heat, by which a part of the redundant acid is expelled; but such an excess of acid remains as is neutralized by the second equal portion of alkali reserved for that purpose.

Super-oxalate of potash is also proved to be an exact binoxalate. Two equal quantities are taken of salt of sorrel; one is exposed to a red heat, to destroy the whole of its acid, after which the alkali that remains is just sufficient to neutralize the redundant acid of the other portion.

In addition to the preceding compounds selected as distinct examples of semi-acid and bin-acid salts, the author has observed one remarkable instance of a more extended and general prevalence of the same law. For when the circumstances are such as to admit the union of a further quantity of oxalic acid with potash, the quantity is again doubled; so that the potash present is sufficient to saturate only one part in four of the acid contained in any quantity of the salt; and, consequently, the three redundant parts of acid require for their neutralization the alkali of three equal quantities of this quadroxalate, which may be obtained by burning, as proof that the proportion has been rightly ascertained.

The last experiment is designed to determine whether potash would

also unite with three quantities of oxalic acid; but it was found, that when two parts of potash are in solution with six equivalent quantities of oxalic acid, they do not crystallize together in this proportion; but one part of the potash becomes a true binoxalate by union with two parts out of the six of oxalic acid taken; and the other part of potash is found united with the remaining four parts of acid.

The author expresses an opinion that we shall not be able to explain satisfactorily, why this acid refuses to unite in the proportion of 3 to 1, till we can attain a just conception of the geometrical arrangement of the elementary particles in all the three dimensions of solid extension. It being supposed, for instance, that the particles are spherical (which is the simplest hypothesis), if they unite 1 to 1, there is but one mode of union. If 2 particles are united to 1, the 2 particles will arrange themselves at opposite poles of that to which they are united. If there be 3 particles, the only regular position in which they could remain is in the form of a triangle in a great circle surrounding the single spherule; but for want of similar matter at the poles of this circle, the equilibrium would not be stable. But again, if there be 4 to 1, a stable equilibrium would occur, when they assume the form of a regular tetrahedron, surrounding the single particle.

But as the author does not place much reliance on this explanation, since such a geometrical arrangement of the primary elements is altogether conjectural, he is desirous that it should not be confounded with the results of the facts above related, which are distinct and satisfactory with respect to the existence of the law of simple multiples.

On the Inconvertibility of Bark into Alburnum. By Thomas Andrew Knight, *Esq. F.R.S. In a Letter to Sir* Joseph Banks, *K.B. P.R.S.* Read February 4, 1808. [*Phil. Trans.* 1808, *p.* 103.]

Mr. Knight having on a former occasion observed the bark of trees to originate from a fluid exuding from both bark and alburnum, continues the subject by observations, tending to prove that bark thus formed always remains in the state of bark, and that no part of it is ever converted into alburnum, as various eminent naturalists have maintained.

Equal portions of bark from several branches of an apple and a crab-tree were removed by circular incisions, and transposed from tree to tree in the spring; and a vital union was secured by bandages, and by a plaster of bees' wax and turpentine.

When some pieces of bark were removed in the autumn of the same year, a layer of alburnum was found to have been formed beneath them in every instance; that of the crab-tree having the colour and roughness of the stock on which it was produced, while that of the apple-tree showed none of the sinuosities of the bark of the crab-tree which covered it; neither did the vessels and fibres of the newly-generated alburnum in any degree correspond with those of the trans-